

#### 4.4 DFT

$$g_k(t) = e^{\frac{j2\pi k t}{T}}$$

$$f(t) = c_0 g_0(t) + c_1 g_1(t) + c_2 g_2(t) + \dots + c_{N-1} g_{N-1}(t)$$

$$\begin{bmatrix} f(t_0) \\ f(t_1) \\ \vdots \\ f(t_{N-1}) \end{bmatrix} = c_0 \begin{bmatrix} - \\ - \\ \vdots \\ - \end{bmatrix} + c_1 \begin{bmatrix} - \\ - \\ \vdots \\ - \end{bmatrix} + \dots$$

$$\sin(2\pi \cdot 5 \cdot t)$$

$$B = (2\pi \cdot 5) \quad p = \frac{2\pi}{B} = \frac{2\pi}{2\pi \cdot 5} = \frac{1}{5}$$

$$p = \frac{1}{5}$$

$$f_{\text{req}} = \frac{1}{p} = \frac{1}{1/5} = 5$$

$$f = 5$$

Two Billion Computations ... use FFT

$$\begin{bmatrix} 44,100 \\ \vdots \\ 44,100 \end{bmatrix}$$